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ABSTRACT

For a school year, a language arts software program was used to help special needs children in Marblehead, Massachusetts who represented a range of learning disabilities and emotional, behavioral and physical disorders of varying degrees of severity. The program had three major components, entitled "Nouns," "Verbs," and "Adjectives." These components encompassed both drill and practice sections and creative writing. The following general principles applying to special needs children were incorporated in the program: individualization, personalized instruction, repetitions of principles and vocabulary, self-paced activity, ease of use, positive response to answers, and hierarchy of skills in exercise design. The study included 30 second through sixth graders, evenly divided between an experimental and a control group. Language sections of McGraw Hill's Comprehensive Tests of Basic Skills (CTBS) were used as pretest and posttest measures of academic change, while the Coopersmith's Self-Esteem Inventory and anecdotal data recorded feelings of self-worth before and after intervention. Of the four areas addressed in the study through the CTBS testing, two met expected gains (vocabulary and spelling) and two did not (language mechanics and language expression). The experimental group showed an increase of 3.07 points on the Self-Esteem Inventory, while the controls registered a decrease of 1.20 points. Case studies and charts indicating each child's academic and affective gains are provided. Among other materials, appendices include the questionnaire for teachers; the self-esteem inventory; a sample log; and data on changes in vocabulary, spelling, language mechanics, language expression, and self-esteem scores. (AS)

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The Development And Use Of A Language Arts Computer Software Program Appropriate For Special Needs Children

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NOVA UNIVERSITY

The Development And Use Of A Language Arts Computer Software Program Appropriate For Special Needs Children

Practicum II Report Submitted To The Faculty Of The Early Childhood Education Program In Candidacy For The Degree Of
Doctor of Education

By

Jo-Anne Murphy

Nova University - Cluster 11
August 1984

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Abstract

The Development and Use of a Language Arts Computer Software Program Appropriate for Special Needs Children. Murphy, Jo-Anne D. 1984: Practicum Report, Nova University. Ed.D. Early Childhood Education Program.

Descriptors: Computer Assisted Instruction/ Computer Oriented Programs/ Special Education/ Learning Disabilities/ Learning Problems/ Resource Room Programs/ Special Programs/ Mainstreaming/ Resource Teachers.

This practicum addressed the desirability of and need for children, especially those with special needs, to become more familiar with and utilize the computer. A Literature search confirmed the fact that computers could be a most appropriate tool for the special needs student and indicated the paucity of appropriate software available for this population.

The writer created and implemented for one school year, a Language Arts Software Program which encompassed both drill and practice sections and creative writing. The study included thirty Resource Room children, divided evenly between an experimental and a control group. Standardized tests were used as pre and post-measures of academic change, while a self-esteem inventory and anecdotal data recorded feelings of pre and post-self-worth.

The author's goals were: (1) to convince the administrators in the district of the worth of CAI for their

special needs population; (2) to show more academic growth with the experimental group in the areas of Vocabulary, Spelling, Language Mechanics and Language Expression; and (3) to show more positive feelings of self-worth and positive feelings towards school in general in the experimental group.

As a result of the study, the author's system will support the use of computers with special needs students next year and will include the author's program among the software. The goal of academic growth for the experimental group was met in two of the areas, Vocabulary and Spelling, and substantial increases in self-esteem and more positive feeling toward school were achieved as a result of the pilot program and use of the computer.

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Chapter One - The Introduction

A. The Community:

The town of Marblehead is a picturesque, quaint community located fifteen miles north of Boston on the Atlantic seacoast of Massachusetts. As in many seacoast communities, fishing is the major industry and sailmaking is a second major industry. Due to its quaintness and proximity to the sea, as well as its historical background, tourism is another important industry during the summer months.

"Old Town", the section of town that dates back to the Revolutionary War, is located along the harbor. It is filled with little shops, restaurants and studios which carry the products created by the large artist population that resides here. The homes, built in the early 1700's, are very close together, and are lined along the narrow, winding cobblestone streets framing the harbor. Recently many of these homes have been converted to apartments and condominiums. This area is reminiscent of the era where the horse and buggy was the common mode of transportation.

The remainder of the town is a typical suburban, affluent, white-collar community with single family homes along tree-shaded streets that are valued from $75,000 to $250,000. There is also an island joined by a causeway to the main section of the town called "The Neck". Homes here are valued typically above $250,000.

The town has three yacht clubs which draw, during the summer season, sailing and racing enthusiasts, fishermen, and other vacationers who enjoy the sea.

1983 places the year-round population of the town at slightly over 20,000, and its area encompasses 4.4 square miles.

B. Writer's Role, Responsibilities and the Work Setting:

The town department which is allocated the most funding is the school department. There are currently five elementary schools (K-5), one middle school (6-8), and a four year high school. The latest 1983-84 total enrollment is 2,814 students (K-5, 1,017; 6-8, 728; and 9-12, 1,069.) These figures were found in the Annual Town Report of 1983.

There is a superintendent of schools, and a School Board comprised of five elected members who control fiscal matters and policies of the school system.

Because of Massachusetts Public Law 766, which calls for adequate and appropriate education for all special needs children, and the new federal law 94-142, the education for all handicapped children act, each elementary school has a resource teacher, the middle school has two resource teachers, and the high school also has two resource teachers. These teachers work with children who can be mainstreamed into regular classes for at least forty per cent of the week and who spend varying amounts of time in a resource room. These students have learning disabilities, emotional or behavioral disorders, physical disabilities, or may be slow learners, all of which make some modification of regular education necessary. There are also five classes from pre-school through high school that service more severe special needs students. These are called resource classes and are self-contained and taught by resource class teachers.

The remaining special education staff is comprised of two elementary counselors in the elementary schools, who also serve as Child Study Team Chairpeople, a kinesiologist, an occupational therapist, three speech and language therapists, and a school psychologist to service the entire school population. The town has had a Special Education Director for over four years, and the department and programs have grown dramatically under her supervision. The middle school and the high school have an additional special educator in the role of Child Study Chairperson.

The writer is a resource teacher in one of the elementary schools in the district, and has held that position for seven years. The duties of the resource teacher include sitting on the Child Study Team, doing diagnostic testing and report writing for children referred for a Core Evaluation, writing goals and objectives for Individual Educational Plans, teaching in the resource room, and performing the role of generic specialist in helping the classroom teacher adapt curriculum and materials to accomodate the special education children mainstreamed into their classrooms for some period of time. It is also the role of the resource teacher to set up and maintain good lines of communications between the parents of the children he/she services, the classroom teachers, and the administrators in the system. Written quarterly reports are mandated, and two parent conferences are suggested. It is not unusual in the case of more severely impaired children to have daily written reports.

Because the parents of the community are generally well educated, they expect a superior quality education for their children and exert more critical involvement than some of the larger and less affluent neighboring communities where the author has also taught. The parents expect all of their teachers to be highly motivated, and to keep up with current trends and innovations in education, and to implement them in their classrooms.

Computer technology is one of the advances that parents expect as part of the education available for their children. The parents of special needs children are no different, and are advocating for their children to be included in the computer training being offered, rationalizing that some expertise in this field would make their children more employable in the world they will ultimately be entering, and because using and learning on the computer will make their children feel less special and more like their non-special needs peers.

Despite fiscal constraints, a sympathetic ear has been given to accelerated computer literacy in the schools by the Governor of the Commonwealth of Massachusetts, Michael Dukakis. He stated in his July 23rd, 1983 address to the North Shore Economic Development Conference held at Salem State College that:"No student should be given a high school diploma without having taken a computer literacy course." He noted the importance of this skill for students entering the work force in a state where the "high tech" industry is such an important employer.

It seems to the author that the time to advocate for special needs children to have a chance to become part of the "computer age" may have come!

Chapter Two - Study of the Problem

A. Description of the Problem Situation and the Problem Statement:

The past several years have produced immense growth in the development of low cost, powerful computers. In what is being called "the age of the computer", these instruments are being used in industry, in schools and in the home. Research indicates that many homes already have, or within the next few years will have, a personal computer.

Since the use of the computer in educational settings is also growing, teachers are being offered in-service courses in computer literacy so they can in turn help their students learn. In an effort to promote their own computers, companies like Apple and Tandy (Radio Shack) have offered grants to school systems to obtain hardware, and have also offered training sessions to teach school personnel how to use their computers.

Although we see the entrance of the computer into the educational setting, the vast majority of school systems still do not offer computer literacy to their elementary special needs populations. This is the case in Marblehead, Massachusetts, the author's community. Since underutilization of any resource is wasteful, there must be a change if this segment of the population is to function in the computer age in which we live.

Research by Budoff and Hutten (1982) indicates that it is probable that special needs populations can receive greater benefits from CAI (computer assisted instruction) than has been reported for non-special needs groups. They state that children who have experienced a prolonged history of failure may find the computer especially useful. Their theory is that the non-threatening and patient computer can ensure the child a failure-free mastery of new skills or knowledge, or can reinforce or support prior attainments. It gives the child a sense of increased competence.

New research by Harvey and Ginther (1984) suggests that the classroom teacher and the local school can take the initiative to ensure that the promise of the computer is fulfilling for learners with special needs. Research, they continue, suggests an excellent opportunity for effective computer utilization for disabled learners. The design of intervention and adaptations, coupled with long-range strategies for making the appropriate software and hardware available, is crucial and can be the basis for improving the quality of instruction for special needs learners.

The problem to be addressed in the author's community was to provide special needs children appropriate CAI (computer assisted instruction) to determine whether this method of instruction was more efficient and concomitantly increased each student's self esteem and attitude towards academic learning.

B. Evidence of the Problem:

The parents and resource teachers in the author's community had become increasingly frustrated because of the lack of opportunity for their children to use the computer on a regular basis. (There are two to three computers in each of five elementary schools in the district.) The children had the desire to use the computer but felt more "special" because they did not have access to the machines.

The author devised a questionnaire which was sent to resource/reading teachers in her own community and the five surrounding communities (See Appendices A & B) to see if they were experiencing problems similar to those in the author's district. One of the communities is similar to the author's, small and affluent, and the other four are larger cities ranging from two that are considered inner city districts with a low socio-economic population, to the remaining two that are cities of average, more middle-class socio-economic status.

There were 97 questionnaires sent out; 83 were returned. The overwhelming consensus was that although there were computers in the schools, in all cities polled, the special needs population was not using them. All schools polled had access to at least one computer but only 4 of the 83 respondees had attempted to use the computer with their students, as had the author. It was an almost unanimous consensus (82) that programs available were not appropriate for their populations, including three of the respondees who had tried using the computer. Only one of the four attempting usage felt she had real success with her students and she was using a simplified Logo system.

Teachers were very explicit in their desire to see programs in language/reading which would be slow in pace, broken down into manageable steps and that would be open-ended enough to meet their student's needs.

Indicative of the kinds of comments received on the questionnaires were:

1. "I'd love to have material that would be appropriate for my special needs population! Good luck and keep me posted."
2. "Most software is so disappointing, not good for my students."
3. "Would like to have software designed to improve basic skills that is paced slow enough for the kids that I service."

4. "If you find anything that is appropriate, let me know! I'd welcome it."

5. "My kids are dying to use the computer but we have nothing to use with them."

6. "I'm sure my kids would benefit from the computer, but my principal doesn't."

In searching the literature, there were several references to lack of good quality software for special education. Hofmeister (1982) states "although microcomputers will undoubtedly make a contribution to special education, educators face problems because of poor quality of available computer assisted instruction (CAI) software and the limited supply of hardware."

Stallard (1982) felt that the poor quality of software developed for special needs children underscored the problems inherent in reliance to others. The computer experts developing the programs understand the technology, but do not understand the needs of special children and their teachers.

The author also researched the catalogs of several major computer software companies such as Xerox, Spinnaker, Apple, Texas Instruments, Atari, Radio Shack (Tandy), I.B.M. and MECS (Minnesota Educators Computers Systems). There were only a scattering of programs labeled for special needs. Several that were so labeled were previewed by the author and found to be lacking in special education pedagogy, though they were closer to meeting the needs of the children than were the programs developed for normal populations. One spelling program, for example, had a pace that was far too rapid for special needs children, there were not enough repetitions, not enough positive reinforcement for correct answers and too much negative reinforcement for a wrong answer.

In previewing these programs, the author tried several with her students, and found that the children became frustrated with them.

A need for the development of appropriate software seemed to be indicated by researchers and the teachers working with special needs children.

C. Causes of the problem:

Special needs children who attend public elementary schools, including the elementary schools in the author's community, did not have access to computer instruction. There appear to be several reasons or causes for this lack of instruction. As has been discussed earlier in this chapter, the lack of appropriate and quality software is one major reason for this void.

Some professionals may have the misconception that special needs children cannot learn how to use computers. Research seems to prove just the opposite of this viewpoint. Edwards et al. (1975) concluded that computer assisted instruction seems to be more effective with low ability students than with middle or upper ability students. Jung (N.D.) feels that the microcomputer when used with appropriate input and output devices can become the "eyes" for those visually impaired and the "voice" to those who can not talk. Several case studies were reported on severely handicapped individuals who had successfully used microcomputers as a communication prosthesis with especially adapted equipment. Other studies that show successes with severely handicapped children will be cited later in this chapter. It is interesting to note that many of the successful studies reported have been projects with children far more impaired than the children that would be found in most public school systems.

Another cause for the lack of instruction provided for special needs children might be that school systems cogitate they cannot afford the investment in hardware and software for a minority population, when a larger population can be reached in the regular classroom.

In Massachusetts, a 1980 referendum called Proposition 2 1/2 has limited the major source of income of local government units. Proposition 2 1/2 mandated that municipalities could not tax real estate above 2 1/2 per cent of its fair market value. Since municipal revenues are raised primarily from property taxes, available funds have been severely restricted. Additionally, fiscal autonomy of school committees has been eliminated, budgets have been cut, and are scrutinized more carefully. Perhaps if administrators could be shown the worth of computer assisted instruction for their special needs populations, they would be more supportive of such endeavors.

Another reason that special needs children may not be getting computer time is that the special needs child's pace may be very slow, and there is not enough computer time available for individual attention, or enough time to have them work through the programs. This may be especially true if programs being tried are developed for the use of regular education. Adaptation of these programs so the child can use them could take a great deal of time and energy on the part of the teacher.

Lack of appropriate programming, fiscal constraints in providing materials and hardware for a minority population, and lack of conviction that CAI will work for special needs populations all seem to be part of the reason for the lack of computer instruction with public school elementary special needs populations.

D. Literature Search:

As the researcher delved into the literature, she found that computers are in fact being used in the field of special education and have been for several years.

Their use was broken down into four categories:

1. Administration - management of names, numbers and services needed for special needs children.
2. I.E.P. Management and Development.
3. Assessments.
4. Instruction.

It is the latter aspect, instruction, that will be emphasized in this report.

Several studies indicated that the computer was an excellent source of motivation for the special needs child. In a study completed by Kleinman, Humphrey and Lindsay (1981), children with attentional problems and hyperactivity showed that they were willing to spend significantly more time working problems on the computer. They spent an average of 23 minutes working on the machine, an unusually long time for hyperactive children to remain at one task. Informal interviews with the children confirmed their strong preference for the computer. They told the interviewer that the problems seemed easier on the computer; it was easier not to have to write the answer down; and they were eager to work on the computer again. The study further concluded that rote tasks such as drill and practice motivated the children greatly, could be adapted to the children's style and needs, and provided immediate feedback.

A report written by a resource teacher in Brookline, Massachusetts, whose students were participants in the "Brookline Logo Project", developed at the Artificial Intelligence Laboratory at M.I.T. and recorded by Weir and Watts (1979), stated that as well as increased academic achievement, her students displayed growth in personal characteristics such as the ability to sustain interest in a project. There was also evidence of increased self esteem.

Increased motivation is also indicated in a case study written about a child enrolled in a project by Weir (1981):

> Keith has a learning disability called dyslexia. He was eleven years old when I met him. He had been a pupil at a special school for the learning disabled for four years and had come to the clinic at Children's Hospital for an assessment. He spent 40 minutes interacting with the computer Logo system I was demonstrating for the clinic personnel. His performance was excellent, way beyond what would be expected from a child of this age, or from a beginner at any age, for that matter. In the first half-hour, he wrote a program which drew a snowman, effortlessly mastering the set of Logo primitives needed, and centering the hat on the circular head without hesitation or error. He had been labeled

> as having "poor attention span" and "low motivation." We saw no evidence of that. All through the session, he was totally engaged by the programming he was doing, and he had to be practically dragged away from the machine long before he was ready to go. (Page 76)

She stated at the conclusion of her report that a high degree of motivation offers the best chance for significant learning. The motivation of the students in her study was evidenced by the fact that they would come into school an hour early, and skip part of their lunch break to work on the computer.

Splittgerber (1979) declared that properly designed content for the microcomputer can permit instruction that incorporates effective teaching/learning principles, and also felt that the motivational value of the medium was high and that motivation was a crucial factor in learning.

Howe (1981) stated that the computer from the child's point of view is a familiar, exciting device which can solve some very difficult problems, and felt that its motivational aspects stemmed from the fact that it was untiring, predictable, never bored, never angry and even obedient. He further stated "it has all the characteristics that most people lack, but which are reckoned to be highly beneficial when teaching backward children."

Senf (1983) reported that the microcomputer and special education share the hallmark of individualization. He indicated that the computer is a fine teaching ally for it is patient, non-judgmental, and will give accurate, consistent and timely feedback. It also has intrinsic appeal and the learning disabled child will labor long at the computer when he/she would have been turned off by the same material in workbook format.

The fact that the computer is highly motivating for all children including those with special needs seems clear. Literature also supports the premise that special needs children do in fact learn from the use of the computer was indicated in several studies. It is interesting that in these studies, severely impaired children have achieved success with the computer. as well as children with attentional/behavioral disabilities.

As a result of reading Dr. Weir's article on experiments with Logo and the computer at the Cotting School for Handicapped Children (1981), the author visited the school. The school is located in the city of Boston, and was originally established for children crippled by polio. Now, children with cerebral palsy, birth injuries such as spina bifida, and trauma injuries are enrolled in the school. Generally, they are children with average or above-average intelligence, though those with a lower I.Q. are not excluded. All of the children are exposed to the Logo Project on a grant from M.I.T. (Logo is a simplified graphic computer language developed for elementary students, to cultivate skills in spatial reasoning and problem solving).

Scientists at M.I.T. have developed adaptations for the computer so children with limited mobility could use the machine. Many of these adaptations were fascinating. Those children with limited arm mobility had a large board, with several large buttons, attached to their computers. These buttons could be pushed by an elbow, the heel of a hand, or by a stick or paddle. (These buttons were labeled up, down, left, right, etc.) Children with limited expressive language were assisted by a voice synthesizer. A word processing unit was utilized by children who could not speak, as well as children who were using the processor because their fine motor limitations made writing with pen or pencil difficult.

The Florida press cited two blind students that have not only mastered the computer, but also have used the medium as a vehicle in getting their school work accomplished. One is a seven year old computer wizard, the other a college student majoring in computer science.

Excellent results have also been documented in working with deaf children in computer literacy. A model program for elementary children was developed by researchers from Stanford University that was conducted at the nearby Kendall School. The materials were developed due to a dearth of suitable materials for deaf children. The children in the study ranged in age from 8 to 15 and the program consisted of drill and practice in both math and language. The children found the program motivating, interacted with the computer (something that deaf children find difficult) and showed academic growth. The project has been expanded to include other schools for the deaf as a result of this program, according to Nomeland and Harris (1976).

Several segments of the literature indicate the high probability of success using appropriate software in a special setting. Joiner et al. (1980) stated that:

> The pedagogical element that distinguishes special education from regular education is its openness to technical innovation and its assimilation of technology into real and continuing practices for the benefit of special children.

He felt that special educators will recognize that appropriate technology can be used to maximize the development of handicapped individuals or to help overcome their disabilities.

Hannaford and Sloane (1981) indicated that computers can act as a tireless teacher's aide, allowing highly interactive learning to take place at the individual student's rate of learning. They cautioned, however, that the computer would be useless without appropriate educational programs and software.

Researchers have shown that the computer can be motivating, that it can work with even severely impaired special needs children, and that the probability of success is great, if the software is appropriate to meet the children's needs.

There are several studies that suggest some of the qualities that appropriate software for special needs children should include which were most helpful to the author in creating her software program.

Caldwell and Rizza (1979) have identified the following six criteria for instructional software design of special needs materials:

1. It should be individualized with immediate and frequent feedback to learner responses.
2. It should present a comprehensive curriculum organized into a hierarchy of skills.
3. Intended learner outcomes should be articulated in terms of performance objectives.

4. Progress should be measured by mastery of performance objectives.
5. Diagnostic and prescriptive strategies should be used to place the learner appropriately in the program.
6. A multi-sensory format should be employed.

Kleiman et al. (1981) believe the following characteristics should be considered in the design of software for special needs children:

1. The level of the program difficulty should be individually tailored for each child.
2. The display format on the computer should be designed to be easily readable. (Extra spaces, limited text displayed at one time, etc.)
3. Answer format should be as simple as possible, close to paper and pencil format.
4. Problem solving should be self-paced with no time constraints in answering.
5. Motivational aspects should be incorporated (e.g. graphics, praise statements following correct answer; for incorrect answer, another try should be given and ultimately the correct answer will be given.)

Hannaford and Sloane (1981) stress that appropriate software for special needs students should address the following three broad criteria:

1. Address student/teacher needs.
2. Have instructional integrity.
3. Have technical adequacy and utility.

Some concrete examples of addressing student/teacher needs would be motivating the student, providing appropriate material to meet their needs, meeting the individual learning styles of the student, and assuring that the program assist the teacher in teaching a skill.

Instructional integrity of material should include such principles as: behavioral/instructional objectives, the material presented in a concrete way with many examples, self-pacing and immediate feedback, and meaningful interaction between the student and the computer.

Technical adequacy and utility includes such principles as: assuring the material is re-usable, the matching of the student's style with the presentation, the availability of "print-out" materials, and keeping the initial cost of the program reasonable.

These same authors also indicated that the microcomputer, when paired with appropriate educational programming, is more than just a machine, it is a teaching aid which can produce some of the following objectives:

1. Provide a multi-sensory approach to learning.
2. Be used to teach a wide range of subject matter.
3. Be used with a diverse population of special needs children.
4. Provide direct individualized interative instruction.
5. Allow a student to learn at his/her own rate.
6. "Remember" student responses.
7. Provide instant feedback.
8. Give a variety of reinforcements.
9. Provide remediation, development or enrichment pending on the needs of the learner.
10. Provide repetition, drill and practice in a meaningful way.
11. Provide diagnostic and prescriptive information to the teacher.

Several authors offered cautions, suggestions and report studies involving learning disabled children specifically.

Maddux (1983) cautioned teachers against using commercial software now available for learning disabled children, for it is not always consistent with what is known about child development and how children learn. In other words, he believes it may be pedagogically poor for learning disabled children. The reason was that programmers are usually not master teachers or experts on how learning disabled children learn. He further asserted that although drill and practice programs may be motivational, and, therefore useful, the real potential of the computer lies in using it creatively, such as the word processing unit to create text. Word processing with spelling and grammar "checker" features is useful to children with writing deficits, since they greatly reduce or eliminate the need for teacher criticism, motivate the child to learn to type, and take the drudgery out of re-writing or revising what has already been written.

Hagan (1984) agreed with Maddux in championing the word processor. She makes the strong statement that microcomputers and the word processing element in particular, are "equal to the reinvention of written language."

She also asserted that authoring systems (generic programs) in which teachers can devise their own text for children are perfect tools for individualizing the needs of the learning disabled child.

A new study, Boettcher (1983) listed several characteristics beneficial in educating learning disabled children that the microcomputer possesses. They are:

1. The computer can provide a secure one-to-one learning environment.

2. The computer can provide a truly individualized program.
3. The computer can demand responses and, therefore, decisions from every student.
4. The computer can provide prompt immediate feedback.
5. The computer can require type-in responses. (This may help deal with reversals, etc.)
6. The computer can help provide decision points.
7. The computer can provide mathematical and/or linguistic modeling.
8. The computer can provide multi-sensory learning experiences.

An additional study by Halpern (1984) suggested that teachers should create their own software and, in doing so, should learn to decompose, in an explicit fashion, problems into simple components which their students can tackle. It is imperative to emphasize the obvious intermediary steps which are done unconsciously by most people and can be overlooked in the education of the learning disabled student. He stated teachers must learn to break down skills into a hierarchy, and that the computer is the perfect tool to accomplish this.

McDermott and Watkins (1983) reaffirmed this idea when they said that the "more salient features of CAI are highly compatible with the major instructional and curricular principles recommended for learning disabled children."

A study conducted in the "Silicon Valley" in California produced results that were beneficial to the self-esteem of the learning disabled, as well as to their academic growth.

At the Lakewood Elementary School in Sunnyvale, eleven learning disabled children turned the tables on their mainstreamed peers. Here, the resource room students have been trained on and have become experts in computer use. The regular education children come to the resource room to be tutored.

This was the brainstorm of principal Dr. Patricia Bubenik, as reported by Messinger (1983). Assisted by regular and special teachers, a grant of $500 was written and obtained. Hardware and software were purchased. (The software at first was at an easy level that the children could read to establish confidence. Later, more difficult software was presented.)

The question was asked "Why not buy workbooks and manipulatives with the money?". Bubenik replied that manipulatives and workbooks do not bring the same feelings of achievement as do the computers, and kids respect us for giving them a chance to work with grown-up machines. The program, she felt, did wonders for the student's self-esteem. "First they saw the computers as smart, then they saw that they were controlling the computers, and the feeling of smart transferred to themselves,and then they taught others. Their self-confidence just took off!"

Literature has clearly shown that the computer is indeed a motivational tool for the special needs child. That severely handicapped children, learning disabled children, and children with emotional/behavioral deficits can learn using the computer and that if programs are designed appropriately, success rates can be even better.

Since these experts have shown the benefits that can be derived from use of the computer and predict even greater gains with a wider population, it would be unfortunate if this broader population of special needs children are not trained and efforts are not made to include them in the "computer age". These students could be made to feel more discriminated against and may be made more unemployable if they are not provided with a chance to learn through and master the use of the computer.

Chapter Three - Anticipated Outcomes And Evaluation Instruments

A. General Goals:

This practicum was designed to provide special needs children with a disability that affects the area of language arts, with a newly created computer software program. The program gave them the opportunity to assimilate information more effectively, at a faster rate, and to make such learning more motivational by providing them with a program tailored to their individual special needs. The program was developed by a special educator, the author. Further goals of the author were to increase the self-esteem of the children using and mastering the program and to improve their overall outlook about school work.

Favorable results at the conclusion of this study, which used appropriately designed software, were used to persuade school administrators of the worth of CAI with their special needs students. In addition, the author convinced the administrators in the light of these successes to provide computers for exclusive use in the resource rooms in the district.

B. Administrative Procedures:

There were two groups involved in the study. The experimental group, who utilized the computer program, and the control group who would not. Each group was to contain fifteen children who had special needs in language arts.

The same testing was to be used for both groups. The academic section of the study employed the language portions of McGraw Hill's CTBS (Comprehensive Tests of Basic Skills) Achievement Tests. It is the policy of the school system that these achievement tests be given to all Marblehead elementary school children in May. They were to be administered to the children in a group, in their homerooms by their classroom teachers. It was a timed, objective test, the children would write down their answers on a sheet, and the tests were to be machine-scored by a testing service. The results would be returned to the schools several weeks later for the perusal of both parents and teachers. (See N.B. on Chart One for exceptions). Both the pre and post-academic tests were to be administered in this fashion.

The same test for the affective portion of the study, Coopersmith's Self-Esteem Inventory, was also to be given to both groups twice. Once at the beginning of the study, and once at the end of the study. (See Appendix C.) The inventory was broken down into five areas: General Self, Social Self Peers, Home Parents, Lie Scale and School Academic. Both the child's self-esteem was to be measured, as well as defensive reactions as found in the sub-scale Lie Scale. Those were to be administered individually, by the resource teachers taking part in the study. The teachers were to read the questions to the non-readers and the readers would mark down their own answers. There was to be no time constraint but a twenty to thirty minute period would allow enough time for a single administration.

C. Behavior Expected, Assessment Instruments and Standard of Performance:

It was expected that the following specific objectives would be met after the children completed the computer program:

1. Each child would be able to recognize and label a noun, a verb and an adjective in a simple sentence.
2. Each child would be able to recognize and develop the proper sequence and/or syntax in a sentence. Both "asking" and "telling" sentences (declarative and interrogative) would be utilized and mastered.
3. Simple punctuation would be mastered: capitals at the beginning of a sentence and for names, and periods or question marks at the end of a sentence.
4. Mastery of a substantial list of sight words/ spelling words, including the meaning of each word mastered.

5. A feeling of familiarity with the computer by being able to go throughout a complete program from beginning to end, without the aid of a teacher.
6. A feeling of greater self-esteem and more positive feelings towards learning in general as a result of success completing the entire program.

Mastery of these general objectives would be determined as the children progressed through the program by teacher observation, as well as CTBS scores. As noted above, each child would have, in addition to these specific computer objectives, a set of specific and individualized objectives developed according to need and/or performance level and taken directly from the children's IEP's.

The subjects in the study were to consist of between fifteen and twenty children in the experimental group who had acquired at least a limited reading vocabulary (primer level) up to children with a fifth grade level, and were students housed in homeroom grades two through six. These children were to be students in the author's resource room and from one other resource room in the system. They would be children that were on educational plans which called for language arts instruction in the resource room. They would be on .2 or .3 prototyped plans (which means they spend from 25 per cent to 60 per cent of their time in the resource room), and the rest of their time mainstreamed in regular classes. The range of their disabilities would include slow learners, children with specific learning disabilities, children with attentional/behavioral disorders, and children with any of the above disorders, as well as emotional malfunctions.

In addition to the experimental group, there was to be a control group also consisting of from fifteen to twenty children with the same prototypes with educational plans calling for a language arts program, and with disabilities similar to those of the experimental group. Those children came from two additional resource rooms in the system.

A case study and a chart indicating each child's specific gains both academically and affectively would be included in the final report. As indicated above, the testing given to each Marblehead student each May, the CTBS Achievement Tests, were to be used for the pre and post-testing. May, 1983 was the date of the pre-test and May, 1984 the post-test. Only the portions of the test measuring spelling, vocabulary, language mechanics, and language expression were to be employed in the academic portion of the study.

The average change for each participant in each section was to be calculated, and similar averages for the two groups, control and experimental, were to be determined. It was expected that the average change for the experimental group would be at least twenty per cent greater than the average change for the control group in each section of the CTBS test.

For the affective section of the study, Coopersmith's self-esteem check list was to be administered to each child taking part in the study before the computer program began and re-administered when the program ended in May, 1984. Additionally, anecdotal records pertaining to self-esteem, attitudes towards learning in general, as well as academic gains (sight words, spelling lists, etc.) were to be recorded in a weekly log by the resource teachers taking part in the study. (See Appendix D).

Each child was evaluated diagnostically in May, 1983 and IEP's were developed. Thus, each child's entry level into the program was obtained easily since specific performance objectives were included in the newly formulated IEP's, and were included in the log. The beginning and ending scores for each member of both groups were to be included in the case study/chart. The average change in test scores was to be calculated for each of the two groups as above. It was expected that the average change for the experimental group would be at least twenty per cent greater than the average change for the control group. If both expectations were achieved, the hypothesis of the study would be accepted. General goals expected from use of the program were also to be assessed by the resource teachers' observations and noted in the log.

A breakdown of behavior expected, assessments that were to be used and standard of performance desired appears on the chart on the next page.

Chart One

Behavior Expected	Assessment Instrument	Standard of Performance
Academic Achievement in the Following Areas:		
Spelling Vocabulary Language Mechanics Language Expression	McGraw Hill CTBS Comprehensive Tests of Basic Skills	At least 20% greater grade level growth for the experimental group in all areas tested.
Affective Achievement in the Following Areas:		
Self-Esteem Attitude Towards Academics and Academic Learning	Coopersmith's Self-Esteem Inventory and Anecdotal Records Kept Weekly	At least 20% greater gain in the total inventory for the experimental group.

N.B. Because each child in the study is mainstreamed into a graded homeroom, they will be given the CTBS according to their homeroom grade placement. One exception will be for a child with a reading deficit one year or more below grade level, and then the policy will be to give that child the test appropriate to his/her reading level. Another exception to the normal testing routine will be the removal of a time constraint for a child with a fine motor problem. In any of these cases, there would be a notation in the case study done at the conclusion of the program, and it should also be noted that these exceptions would be part of the child's IEP.

Chapter Four - Solution Strategy

The author determined and became increasingly more concerned that a need existed for the creation of a software program, especially designed with special needs pedagogy, which would be the most effective solution in her setting. Literature also clearly indicated the success in using CAI with children severely impaired. The author also believed that if it could work for them, her less impaired students would also benefit. So she developed the program.

There were several overall goals that the author thought necessary in developing this computer program for special needs children. They were derived from watching her students interact with a computer, knowing their strengths, and weaknesses, as well as researching the literature and following the findings of these authors.

A language arts program was decided upon rather than a math or reading program, since the language area is a need common to a larger population of special needs children in the author's setting. Further, many more skills were encompassed in one language program and could, therefore, reach a larger population of children with different needs.

The program developed by the author was broken down into three major components or discs entitled "Nouns", "Verbs" and "Adjectives". The following general principles applying to special needs children were incorporated in the program.

1. The program was completely individualized.

   Each child had his/her own list of words which could be drawn from sight word vocabulary from basal reading programs or from spelling lists. The child's style in learning to read was easily accommodated. For example, a sight word learner was fed sight word vocabulary from his sight word basal program, spelling lists were chosen using structural analysis skills, e.g. prefixes, suffixes, and roots learned easily by a child with a visual strength. A child with an auditory strength and a visual weakness was taught using spelling and/or reading lists using the word family technique and phonetic principles. The kinesthetic modality was incorporated by the child "writing" on the computer during the final section in the program, creating sentences.

2. The program was personalized.

   Each child's name was entered at the beginning of the program and the computer spoke directly to the child throughout the program assuring a personalized interaction.

3. There were many repetitions of the principles and vocabulary being taught.

Within each component, e.g. the "Noun" component, there were three different kinds of exercises, a total of thirty sentences, as well as a graphic example and sample exercises presented at the outset of the component. Twenty new words were utilized in each component (ten nouns and ten adjectives or ten nouns and ten verbs) so that by the end of each individual module, the twenty words were to be mastered. The child should have been able to read, spell and use appropriately in a sentence each of the twenty words presented. In the case of younger children, or children for whom twenty words were too many, ten words were introduced (nouns, if that is the module being presented) and the ten other words, e.g. verbs will be words already known by the children. The initial explanatory graphic chart could be called back by the child or by the teacher at any time for reinforcement, and added repetitions utilized in the final section where children create their own sentences.

4. The program was a self-paced activity.

   The amount of time needed for a response was flexible, and each child could move the program faster or slower, according to their own needs. The program did not go ahead until the child told it to.

5. The program was easy to use.

   Once begun, the keyboard use is minimal for the first few exercises. In one option, only the numbers one, two and three need to be known. The second option could have the child typing in the word. The exercise that had children create their own sentences, at first requires some adult supervision and help, but as the sentences at first were short, the children gained knowledge of the keyboard as their sentences become more lengthy.

6. Responses to answers were treated in a positive way, whether the answer was correct or incorrect.

   If the answer was correct, a positive reply was given by the computer, as well as academic reinforcement. In the sentence "The dog is happy", John was asked to find a word that names something, a noun. When he chose "dog", the program said, "That's right, John, dog is the name of an animal, dog is a noun." If in the same sentence there was an incorrect answer, the program avoided a negative response like "wrong", or "that's not right", but gave a more positive approach like "Try again, John" and added more informational clues. For example, John chose "happy" which was an incorrect response. A word of encouragement was given and the child was asked to try again; he was also given some additional information to help him make a correct response. The program responded "Try again, John. Happy is how the dog feels. We want the name of an animal, we want a noun." In this way, the child was not criticized for a wrong answer, but gently prodded to find the correct one and given additional clues to help assure the correct response was given.

7. Each of the several exercises in the program was set up in a hierarchy of skills.

The exercises began with simple sentences given to the children (with their own vocabularies used) and they were asked to identify the part of speech. The next exercise used the cloze procedure, which brought comprehension skills into the program to aid in selecting the appropriate word. This built the skill of contextual reading, along with helping the child develop knowledge of the parts of speech. The third exercise gave the children three words from which they constructed their own sentences. At the beginning, all that was expected was the addition of an article or a preposition, but as the children became more familiar with the keyboard, more elaborate sentences were expected, building to a simple paragraph. As this sentence building was progressing, appropriate syntax, spelling and punctuation was taught, and/or reinforced depending on the skill level of each child.

By the end of the program, a set of general performance objectives was to have been met by all children, as well as more personalized objectives obtained from each child's IEP's and according to the need and/or level of performance. The author intentionally avoided the use of graphics at this time, desiring to test the worth of the textual material and seeing if the text itself would provide enough motivation. It was determined, at the conclusion of the program, that graphics were needed and could be added to enrich the program, along with any needed changes.

In addition, because of the individuality of each child's program, a weekly log was kept for each child in the experimental and control groups. The logs held the following information:

1. Specific performance objectives derived from individual educational plans.
2. Scores from any diagnostic testing.
3. Pre and, ultimately, post-test CTBS scores.
4. All vocabulary presented and mastered.
5. Print-outs from section #3 of each module with all creative writing samplings.
6. Coopersmith's pre and, ultimately, post-tests.
7. Anecdotal incidents that may indicate motivational aspects, feelings of self-worth and attitudes towards learning, and the general goals of the program that will be compiled for final documentation. (See Appendix D.)

The logs will be kept by the four resource teachers taking part in the program. The case studies/charts were written by the author and statistical data was compiled and developed by the author, as well, for the final report.

Before implementation of the program, approval was obtained from the Superintendent of Schools, the Director of Special Education, and the principals and resource teachers of the schools which the participants attend.

Both principals where the experimental groups were housed gave permission for use of one computer three mornings each week, so that three twenty to thirty minute segments could be attained by each of the students each week.

The floppy disks for the program were provided and paid for by the author, and initialed with the basic program.

Cooperation was readily obtained by the author from all the staff involved, especially the three resource teachers, whose interest in acquiring appropriate software for their special needs children was as intense as the author's.

It was determined by the author and all her superiors that, for the sake of anonymity, the names of the children in both the experimental group and the control group would never appear in print, and initials would be used by the resource teachers during the study, and letters and numbers would be designated for each child in the final report.

Letters of permission were devised and sent to the parents of both the control and the experimental group (See Appendices E and F), explaining the pilot program. Several parents, largely from the control group, refused to allow their children to take part in the program. Only one parent of a child from the experimental group refused to let his child participate in the study. There were also two children from the experimental group who moved out of town during the year. This reduced the experimental group to fifteen, the same number as the control group.

One major roadblock was encountered by the author in her own setting at the beginning of the study. Although permission was granted in June for her to have the use of a computer in the resource room at least three mornings a week, the principal reneged on this agreement when school began in the fall. He devised a new plan to locate computers in the library of the school, and wanted all computers housed there. This would have required the children in the resource room to go to the library for their computer work. Logistically, this was not practical since the library is located in a different wing, at the opposite end of the school from the resource room. Also, the author serviced between three and seven children each period, and even if the aide walked the children back from one building to another, there would be the loss of the aide from any other services that needed her attention in the resource room.

The problem was solved when the author brought her own computer from home, for the duration of the school year. In this way, the children were under the watchful supervision of the author or aide, and could ask for help when needed, but in the meantime, the teacher or aide was free to work with other students who were not using the computer. One of the goals of the program was that the children should be able to use the computer independently, but the author was cognizant of the fact that a technical or academic problem could occur and she wanted the flexibility of being available to watch the children's interactions and reactions while using the program.

At the time the implementation began, the author decided that she and the other resource teachers who were working with the experimental group would make a list of ideas for improving the current program. Sections that the children particularly liked, disliked, or reacted to in an unusual way would also be noted, with the hope of perfecting the program and making it even more useful after the implementation period was over.

The program thus began the fourth week in September, after the Self-Esteem Inventory was given to both groups and continued through the first week in June. CTBS testing was given in May, throughout the system, and the Self-Esteem Inventory was redone to both groups early in June. Data was then collected by the author for analysis.

Chapter Five: Results, Conclusions Recommendations and Dissemination

A. Results and Conclusions:

Overview:

As a direct result of this project, each school in the author's district will use the computer with its special needs population, effective September 4, 1984. Both the Superintendent of Schools and the Director of Special Education were convinced, after they saw the program in action in the Resource Room, observed the children interacting with the program,and reviewed the results of the study that computers should and would be used in the Special Education program. Further, the Superintendent supported a half-year sabbatical for the author to continue her research and develop additional software programs for pilot usage during the following semester.

The program encompassed by this report will be given to all resource teachers in the author's community at the request of the school administration. This major goal was most successful.

The goal that addressed the self-esteem of the experimental group of students and the overall outlook on school of this same group was also met, with a wider margin than predicted. They were also highly motivated by the CAI. These issues will be addressed more fully in the charts and case studies that follow.

Academic gains presented mixed results. Of the four areas addressed in the study through CTBS testing, two met expected gains (Vocabulary and Spelling) and two did not (Language Mechanics and Language Expression).

Other gains that were not anticipated were achieved, such as the improvement in the flow and quantity of written language. This, and the other gains, will be expanded upon later in this report.

Next, the reader's attention will be focused on the results of the CTBS and Coopersmith testing.

Test Results:

The results of the standardized testing are presented in Chart Two. The investigator's desire for at least 20 per cent greater increase in the experimental group was attained in three of five areas: Vocabulary, Spelling and the Coopersmith Self-Esteem Inventory.

The change in test scores for each individual, the total change for each group, and the average change for each group for all five areas tested are detailed in Appendices H-L.

Chart Two

Results of Pre and Post Tests

Test	Average Growth of Group Control	 Experimental	Score At Which Experimental Group Would Be At Least 20 per cent Greater Than The Control Group
Vocabulary	1.11	1.33	1.33
Spelling	0.47	1.05	0.56
Language Mechanics	1.29	0.71	1.55
Language Expression	1.35	0.79	1.62
Coopersmith	-1.20	3.07	-0.96

The additional growth in the experimental groups' was just 20 per cent for Vocabulary, but was 123 per cent for the Spelling component, which proved to be most successful. In the language areas, the control group grew much more than the experimental group. Possible reasons for this outcome are presented in the section, "Achievement of the Program Goals", later in this chapter.

The Self-Esteem Inventory offered perhaps the most interesting results. While the average score for the control group decreased 1.20 points, the experimental group increased 3.07 points, a spread of 4.27 points. The "Achievement of Program Goals" section also addresses possible reasons for this exceptional growth. One student in each group had a major decrease in the Inventory (36 and 32 points), but even if these students are omitted from the calculations, the control groups' average change would be an increase of 1.29 points, while the experimental groups' change would increase 5.57 points. The spread between the averages would be 4.28, substantially the same spread as when their scores were included. One just offsets the other.

The anecdotal data in the "Case Studies" section which follow offer additional insights into the possible reasons for the larger increase by the experimental group.

Individual Case Studies:

Case Study A.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L. Mech.	L. Exp.	
Pre-test	3.8	4.4	5.1	3.8	80
Post-test	4.1	4.8	5.1	4.5	90
Gain	0.3	0.4	0.0	0.7	10

Student A is an eleven year old fifth grader who is dyslexic. He is the third brother to have this problem and through hard work is now reading only one year below grade level. His parents have just gone through an extremely unpleasant divorce, and this has strongly influenced him. A has always had a healthy self-image except in the academic area, is popular with peers and is a good athlete. At the beginning of the school year, he told the author he didn't want to try to read and write anymore. He was tired of trying so hard and still needing help. He loved, however, the computer, and it was found that his best work was done on the machine. He even wanted to do reports on it because "My hand doesn't hurt as much as when I write." His father bought him a home computer for his birthday in May. His SEI showed a growth of ten points. The subscore of the Coopersmith that was lowest in the pre-test was the academic portion, with five negative answers. The post-test had only one. The author believes that the computer

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was instrumental in this gain, and was the only bright spot that sparked motivation in a rather dreary year in A's life.

Case Study B.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L. Mech	L.Exp.	
Pre-test	2.8	2.1	4.2	2.0	88
Post-test	3.2	13.0	4.2	4.6	90
Gain	0.4	0.9	0.0	2.6	2

Student B is an eight year old third grade boy, with a strong I.Q. who is approaching grade level performance in reading and spelling, after two years of remediation. B has poor visual memory and a history of visual perceptual problems. B has also been caught in the middle of a volatile divorce, and as the year progressed, entered therapy to deal with his anger and fear.

B found immediate success and confidence with the computer, and as the year went on, asked if he could share his program with a pal from class (non-special needs.) It was arranged to have the pal come in during Activity period, and how pleased B was when the boy said "Gee, B,you are an expert at this stuff!" Word quickly passed back to B's homeroom, and during Activity period from then on, B was allowed to tutor his regular classmates, one at a time, using his program. What a boost to the image of both B and the Resource Room in the minds of those third graders!

This was not a planned outcome of the computer usage, but as Messinger and Maddux (1983) reported in their studies, peer tutoring with the special needs child as teacher boosted their self-esteem, for they were not often considered "expert" at anything.

Case Study C.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	3.8	4.1	3.0	3.4	68
Post-test	4.4	4.1	2.3	3.5	84
Gain	0.6	0.0	-0.7	0.1	16

Student C, a nine year old fourth grade boy, has had severe problems in reading and written language skills throughout his school career. The third son, and a very late in life child of older parents, he has been sheltered and pampered and has had real problems with peer relationships.

He became a "computer junkie" and although his language scores as shown above were not as positive as the author would like to see, the flow of his language grew dramatically through the Creative Sentence section of the program. At the beginning of the program, he was writing sentences like "The marvelous ram ran". (Words given ram-ran-marvelous). He was only adding an article to the vocabulary given. By the end of the program, he was writing sentences like "The energetic people in the gymnasium were instructed by the best coach". (Words given people-energetic-instructed). Here, he added prepositional phrases, helping verbs, direct objects, etc. His mechanics and spelling still need work, but at least the flow is coming.

C also made his first friend in another resource student who loved the computer, and they would come in together to work on it.

The author believes C's SEI growth was due to his positive experiences with the computer.

Case Study D.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L. Exp.	
Pre-test	2.7	3.8	2.4	3.2	70
Post-test	4.2	8.1	5.1	4.8	72
Gain	1.5	4.3	2.7	1.6	2

This was the year for student D, a nine year old third grader to excel to such an extent that his special services were terminated at the end of the year. He had a severe auditory processing problem and found phonics and spelling difficult. He also spent two years in second grade. D has always been a very positive person and was delighted with the computer. He told the author that seeing the letters on the keyboard helped him to learn to spell the words. The lists used for D were spelling lists, at first coming from his class, but as the year went on, lists of spelling "sticklers" were added. The computer really seemed to help, judging not only from CTBS gains, but in his actual usage of written language. D was a child who hated to write creatively. (Perhaps because of his spelling problems.) By the end of the year, he was writing paragraphs, using the third section of the program, and will be ready to use a word processing unit by the fourth grade.

Case Study E.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L. Mech.	L. Exp.	
Pre-test	3.9	2.8	2.6	3.3	70
Post-test	4.3	3.9	3.1	4.0	80
Gain	0.4	1.1	0.5	0.7	10

Student E is a ten year old fifth grade girl from a bi-lingual inner city family, bused to our community through the METCO program. Language and reading classes have always been a problem for E. She does not seem to be disabled as much as just lacking experiences and lacking understanding of the language. This first year in the author's community has also been a difficult social experience for her.

E was very suspicious of the resource room, which in her old school in Boston was for "dummies." She was, however, fascinated by the computer and it was a strong motivation for E. (Her uncle, it was learned, worked as a computer programmer.) She was one of the few children who mastered the keyboard easily and that gave her great confidence. She soon set a goal to complete a program a week.

E joined a summer computer club in her own community, and told her counselor she would like to be a computer programmer when she was older. She will also be introduced to the word processor next year, and this has been written into her I.E.P.

Case Study F.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L. Mech.	L. Exp.	
Pre-test	2.9	2.3	2.9	3.7	44
Post-test	3.8	3.0	3.4	4.1	48
Gain	0.9	0.7	0.5	0.4	4

F is a third grade boy with severe fine motor problems, spelling problems and lacking solid writing skills. It was feared at the beginning of the program that his fine motor problems would impede his computer progress, but this fear was never realized. His mother is currently divorcing her second husband and F has felt abandoned. He always tries his best, but is becoming increasingly frustrated as more written work is demanded of him in third grade.

At first, because typing was so laborious for him, F was given a "secretary" (the aide) to do five of his creative sentences, which he dictated, and he did the

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last five himself. The first time F saw his sentences printed out on the computer he said "I have never had a paper that wasn't erased before. I never had a neat paper! Can I please keep it to show Mom I really can do neat work!"

Though his progress was somewhat slower than some of the other students, he gained more confidence in his writing skills and was comfortable in producing ten new sentences with each lesson, something he would never do on paper. Next year will also introduce F to the word processor, and this has been included in his I.E.P. In addition, the current program will be re-offered to him so his computer expertise will increase.

Case Study G.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	3.7	4.0	3.3	4.5	74
Post-test	5.8	4.7	4.4	5.6	78
Gains	2.1	0.7	1.1	1.1	4

Student G is a ten year old fifth grade boy with a history of severe problems in visual sequential memory, and a weakness in written language skills. Very positive gains for G were in vocabulary and spelling. A very bright child, he analyzed his gains in one sentence, saying "Typing out the letters really helps me in learning the order of letters in words." G was a child who typically got all the letters in a word, but confused their order. The computer seemed to help this problem. His flow of language and syntax also improved as the year went on. At the beginning of the year, he wrote this sentence. "He breathed the thick smog." (Words given - smog-thick-breathed). He added only a pronoun and an article. By the end of the year, he was writing sentences like "The tallest student in the dorm was allergic to flowers and grass." (Words given - student-tallest-allergic). Now he was adding prepositional phrases, "helping" verbs and direct objects.

G did so well he was released from special services at the end of the year, but continued computer instruction has been recommended for the mainstream next year.

Case Study H.

	CTBS Scores				Coopersmith
	Voc.	Spelling	L.Mech	L.Exp.	Scores
Pre-test	3.0	2.4	3.2	2.7	50
Post-test	3.9	3.3	3.8	3.0	56
Gains	0.9	0.9	0.6	0.3	6

Student H is a severely learning disabled fourth grade boy, who has auditory processing and memory deficits, and visual sequential memory problems, affecting reading, spelling and written language. Tactile methods have always helped H learn, so it was hoped the

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computer would be a positive experience. He became one of the most successful students in mastering the computer, became a "computer junkie", and was the child who befriended student C. They would come in before school, after school, during activity periods, and would ask for computer time as a reward when other work was done.

H was the only "special needs" student allowed to join the after school computer club. Some of his comments during the school year were: "This is the first thing I've ever really been good at!" or "Now I can tell the difference when writing 'saw' and 'was', w is on top of s and a." (This visual/kinesthetic strategy was later used with many of the children with reversal problems). He also said: "I can be a really good teacher, I like to show people what I know about this!"

H aided a student not included in this study, who had severe emotional problems and was becoming non-communicative, and who would not take instructions from an adult. One day he looked up at the author and said, "This is more like fun than work!"

Case Study I.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	5.3	3.1	3.8	4.8	82
Post-Test	7.4	4.6	4.3	5.7	88
Gains	2.1	1.5	0.5	0.9	6

Student I is a sixth grade boy who has had special education services in reading, language and fine motor since the first grade. He has visual sequential memory problems, and also found phonics difficult.

The computer program and computer time became a favorite with him. He did well at mastering the computer keyboard, though his pace was slow because of the fine motor deficits. He verbalized, however, that he thought he was learning the vocabulary and spelling words best bytyping them and seeing them on the screen. His parents told the resource teacher that he transferred his computer skills by going home and wanting to type his homework. He also commented that "The computer helps me to do neat work".

This was a by-product the author had not anticipated, but was certainly a real bonus, especially for the children with a history of fine motor problems.

Case Study J.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	2.2	4.0	3.6	3.7	68
Post-test	6.0	5.1	5.0	4.9	74
Gains	3.8	1.1	1.4	1.2	6

Student J, a sixth grade boy, has not only had a history of learning problems, visual perceptual and fine motor problems, emotional problems, but is very proud of his "tough guy" image. He started out with a very negative attitude about the computer. Having frequented "Video Game City", he thought anything to do with the computer was "crazy". (Not impossible to understand, for J felt that anything he had trouble with was "crazy", and given his perceptual and motor handicap, he would never be able to be successful at computer games). He approached the computer with great anxiety, but the program won him over on the first day, once he knew he could do it. In J's own words, "Hey, this goes slow so I can keep it up and I don't get'buzzed at' when I do something wrong."

His sight word vocabulary words and spelling words comprised his weekly lists and his scores in the CTBS reflected a positive growth. The computer made such a hit with J that his new stepfather asked the staff's advice in purchasing a home computer with appropriate software for J's learning style.

Case Study K.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	3.1	2.8	3.2	3.2	70
Post-test	4.0	4.0	4.0	4.0	76
Gains	0.9	1.2	0.8	0.8	6

K's severe deficits in auditory and visual memory, plus emotional problems have always made reading and creative writing a real problem for him. His attitude towards school has been increasingly negative.

K has been caught in the middle of a lengthy custody battle, and this has made his personal life full of turmoil. His father began therapy for him early in the school year in hopes of helping him deal with his problems. His psychiatrist reiterated the need for some success experiences scholastically, as well as socially, and it was hoped the computer would help.

He hated coming to the resource room, but seemed to enjoy computer time, especially after his initial anxieties with it were overcome.

It seemed that the multi-modality practice on the computer helped him, as well as the repetitions for in K's words: "When I read in my book in the afternoon, I remember in my mind seeing and typing those words on the computer, and that helps a lot." His overall scores showed greater progress than the previous year, and the computer may well have been the variable that made that growth possible.

Case Study L.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	6.4	4.5	4.3	4.8	66
Post-test	8.0	5.3	5.3	8.1	70
Gains	1.6	0.8	1.0	3.3	4

Spelling and written language have always been a problem for this sixth grade boy. L is very bright, and an extremely verbal child, but was never able to get creative ideas on paper because of his deficits in writing and spelling.

The computer helped this flow of language tremendously, first by giving him confidence in writing the ten sentences and later by letting him turn these sentences into two paragraphs, with five sentences in each. When he was ready to move into paragraph writing, word lists were put into his program that could be combined into writing a paragraph. This was one of the individual goals on his I.E.P., and he certainly achieved it. In L's own words: "I think better with a computer than with a pencil."

The word processor will be included in his special service plan this coming year.

Case Study M.

	CTBS Scores				Coopersmith Scores
	Voc,	Spelling	L.Mech.	L.Exp.	
Pre-test	5.7	3.1	4.3	8.4	86
Post-test	7.4	4.8	4.5	5.7	78
Gains	1.7	1.7	0.2	-2.7	-8

M had a difficult year in sixth grade. A bright, though a very hyperactive child, attending to a task has always been his problem, as well as written language. (It has always been hard to decipher whether M could not write, or could not focus long enough to put it on paper.

At first, he could only do one section of the program at a time, and for the third section, Creative Sentences, he needed two sessions to complete the work. By the end of the year, he could do the program in two sessions, a real improvement for M. He seemed, at least at the end of the year, to be concentrating longer on the computer than on paper and pencil tasks. Research cited earlier in this report indicates that this is often the case with hyperactive children. His flow of language, through his sentences, also improved and lengthened.

He was one of the few children in the pre-Coopersmith SEI to answer all the Lie Scale questions wrong, indicating he was trying to give the answers he thought you wanted. The post-Coopersmith SEI had all the Lie Scale questions answered correctly, so it was assumed he felt less anxious with the inventory at the end of the year, gave more honest answers, and that the final score more closely assesses his self-esteem.

Case Study N.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	3.6	3.4	3.9	3.6	52
Post-test	4.0	4.0	4.8	4.0	62
Gains	0.4	0.6	0.9	0.4	10

N is a sixth grade boy with severe visual/perceptual handicaps and stronger auditory capabilities. He has always found reading by phonics/linguistics easier, so his program used this approach by programming lists within linguistic families. Keenly sensitive to peers calling him "slow" or a "dummy" (using his words), he liked using the computer, once he found it didn't make a "big deal" out of making a mistake. Last year, he told the author, he did a program with his homeroom class and everyone knew he was making mistakes because a buzzer sounded and a face came and stuck out its tongue at him. He said, "I don't want people to know I'm making a mistake. This one helps you get the right answer. I like that."

Case Study O.

	CTBS Scores				Coopersmith Scores
	Voc.	Spelling	L.Mech.	L.Exp.	
Pre-test	4.2	4.2	7.2	3.9	92
Post-test	6.5	4.0	8.4	4.4	60
Gains	2.3	-0.2	1.2	0.5	-32

Student O, a sixth grade boy, is two years below grade level in reading, spelling and writing, and has severe emotional problems. This has been a year of great adjustment for O. Not only was it the first year in the school system, but the first year he has lived with his father. His mother remarried and told the school counselor that she didn't want to be bothered with O. His pre-Coopersmith SEI showed incorrect responses in six out of seven items on the Lie Scale, indicating he was giving answers he thought the teacher wanted. The post-test SEI seemed more honest, and probably more like his real self-esteem.

His sessions on the computer were felt to be very successful, as these were the few sessions when he didn't "act out", was not belligerent, actually seemed "tuned in" to the task, and performed without interruption. He verbalized neither positive or negative feelings about the computer.

Achievement of Program Goals:

In addition to the major goals of this project, the author expected certain goals for the software program to be met. The first goal stated that each child would be able to recognize and label a noun, a verb and an adjective in a simple sentence.

Both evidence from the Language Expression sections of the CTBS and children's own sentences developed in the Creative Sentence section of the program show that this goal was met. The repetition and constant reinforcement throughout all sections of the program contributed to this positive achievement.

The second goal indicated that each child would be able to recognize and develop proper sequence and/or syntax in a sentence.

The CTBS Language Expression Section and data collected from the children's Creative Sentence samplings showed that this goal was also met. Having seen appropriate syntax in the first two sections of the program repetitively, followed by the practice of writing their own sentences, helped the children develop this skill successfully.

The third goal expected the student to master simple punctuation: capitals at the beginning of a sentence and for names, and periods and question marks at the end of a sentence. Data collected from the Language Mechanics section of the CTBS, and analysis of the children's creative sentences show that this was the only goal that was not mastered.

The author believes that there could be two reasons for this. First, the goal of punctuation was too ambitious and too much was expected from one section of the program. Emphasizing punctuation and complete punctuation mastery should be the basis for an entirely separate program.

Secondly, should a goal for punctuation be included, more structure would be needed in the Creative Sentence section, in order to attain this goal. If one or two elements of punctuation were expected and adequate structure set up to monitor these skills, the results might have been quite different.

Suggestions for solving both of these problems are presented in a following section entitled "Recommendations."

The next goal was the mastery of a substantial list of vocabulary/spelling words, including the meaning of each word mastered.

The CTBS sections on Vocabulary and Spelling clearly tested the success of this goal. The repetition, multimodality technique, and use of these words in all three sections of the program could account for this success.

The fifth goal was to develop a feeling of familiarity with the computer by being able to go through a complete program from beginning to end, without the aid of a teacher or aide. Without exception, all fifteen children in the experimental group had mastered this goal by the seventh week of the program.

The final goal was to increase the self-esteem of the children and give them more positive feelings towards learning in general. Both Coopersmith's Inventory and the anecdotal data collected through the implementation period indicated the very successful outcome of this goal.

According to this data, the children had:

1. More positive feelings about themselves while mastering the computer and tutoring regular education peers.
2. They enjoyed seeing their own growth and accomplishments.
3. They were pleased that the program gave them positive feedback and did not accentuate their errors.

4. They were confident after observing how their sentences and flow of language improved from the beginning of the year to the end.

Unanticipated Results:

As noted earlier in this report, there were also several positive aspects or goals the program met that the author did not anticipate:

1. The "regular education" children in the school had a more positive image of the resource room and the resource students in the study. This new respect was achieved because the learning disabled students became so proficient in the use of the computer that they could teach their normal peers. It also got the regular education children into the resource room, which helped begin to remove the stigma and labels associated with the room.
2. Children who were dyslexic and/or prone to reversals were aided by typing out letters and noticing their location on the keyboard.
3. The flow of language of many of the children increased through the use of the creative section. Children seemed to "free up" their creative thoughts more easily through the machine than with paper and pencil.

4. The Creative Sentence section turned out to be the precursor to a word processing program. Although many of the children might have had difficulty starting with a word processing unit, this program helped prepare them for it. As indicated in the case studies, several children have had the word processing program written into their I.E.P.'s for the next academic year because of their success with the author's program.
5. Children with fine motor/handwriting problems produced a "neat" product for the first time in their school careers. The act of using the keyboard acted as a fine motor remediation strategy and strengthening skill, and prepared and motivated the children to learn to type.

B. Recommendations:

Overall, the author believed the program was positive and rewarding to the children in the study, the staff and the administration. Knowledge for improvement of the program gleaned through the implementation and analysis of the test data has aided the author in making the program even better and more useful to the special needs children in the author's district.

Program Alterations:

The following changes will be undertaken in the program:

1. Larger print and more space between lines will be added to accommodate visually and perceptually impaired children.
2. Color and Graphics will be utilized: Color to enhance motivation, to soften the glare and to prevent monotony, and a modicum of graphics for motivation and variety. Care should be taken not to incorporate "video game" noise, confusion and rapid pace, as this would be too stimulating for perceptually impaired or hyperactive students, or those whose pace is slow; (e.g. a seagull would carry a word in his mouth,from the three choices given, to the blank space in the Cloze section.)
3. The introductory chart should be filled in one category and one word at a time in a flashing manner; (e.g. the same seagull could deposit the word appropriately.)
4. There will be a wider selection of commands for an incorrect answer in order to give more explicit clues and better information. For example, in the adjective section, the first error produces a reply like "Dog is the name of an animal; we

want a word that tells us more about the dog." Additional responses could be chosen by the teacher from phrases like: "tell us what the dog looks like", "tell us what color the dog is", "tell us what size the dog is", etc., depending upon the kind of adjectives used.

Textual Modifications:

Actual textual changes, except for the size of print explained previously, would be centered around section three, Creative Sentences. Instead of using this section as a complete punctuation tutorial, only two goals will be addressed:

1. The capital at the beginning of a sentence.
2. The period or question mark at the end of a sentence.

If the first letter of the first word of a sentence is not capitalized, a phrase would appear, "How do you begin a sentence?", and a similar phrase would appear for an incorrect punctuation mark at the end. If none is entered, a phrase, "How do you end a sentence?" would appear. In this way, the creative flow would still be encouraged and these two goals might be met more readily.

Creating Software:

The following suggestions would be recommended to anyone who would like to create software for his/her own population or for special needs students in general:

1. Keep in mind the pedagogical principles that should be common to all special needs children, as addressed by several studies earlier in this report.
2. Select a subject area that has the greatest need for your population (e.g. math, reading, spelling, modality training, etc.). The more children you reach, the better.
3. Gain the support of the administration and other professionals in your system.
4. Gain support of the parents in your district. Volunteer help could be of great benefit at the start of your program.
5. Always try out your ideas and programs with children. They are your best critics and, no matter how good it looks on paper or on a disc, if it does not work with the children, then it is of little value.
6. Keep current on what is available and what is new in the marketplace. Subscribe to a good journal that has monthly computer software reviews. This will help keep you current on what is needed and keep you from "reinventing the wheel."

7. Keep current on grants and monies that you might obtain to support your project, or help you gain hardware. Computer companies like Apple and Tandy have, in the past, been very philanthropic, and associations like The Council for Exceptional Children have offered awards for promising software created by teachers.
8. If you are not a proficient programmer, be sure to consult someone who is during the design part of your program. Thus, you can be aware of and know the capabilities of the computer.

C. Dissemination:

The author was very pleased with the outcome of this study. The majority of goals were met and additional insight was gained for positive ways to change and perfect the program.

There are already plans for the program to be shared with all resource personnel in the author's district, but even further dissemination is anticipated. Special Net and Eric are other ways to share the results, and the author will also submit related articles to journals and publications concerning this study in particular, and computer use with special needs population in general. Also, letters of inquiry have been sent to thirty publishers to interest them in this program.

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Because of the successes achieved in the implementation of this program and the paucity of good special needs software, the author and two of the teachers involved in the study are in the process of forming a software company exclusively for the production of special needs software.

The author had the opportunity to share her program and her views and philosophy on computer usage with special needs populations with the N.A.E.Y.C. convention in Atlanta, Georgia in November, 1983. As with her local peers, she found that teachers were eager to learn how to select appropriate software and how to go about advocating for their populations.

The author, through this project, has found the key that may open the door to computer literacy for special needs children in her community. But much more needs to be done. The challenge is there for special educators everywhere!

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Appendix A

Marblehead Public Schools

2 HUMPHREY STREET **MARBLEHEAD, MASS. 01945** **(617)631-0900**

DR. JAMES KENT, Superintendent of Schools

School Committee:— MARCIA L. SWEENEY, Chairperson DEXTER D. BUCKLIN, Vice-Chairperson PAULINE L. HOWES, Secretary PAUL B. WARREN R. EDWARD CLISBY

L.H. Coffin School
Turner Rd.
Marblehead, Mass. 01945
May 20, 1983

Dear fellow teacher,

Would you take a few minutes to answer the enclosed questionnaire concerning using computers with special needs children and children in need of remedial services.

I will be using the information gleened from this survey for a dissertation project and would appreciate your input.

Enclosed is a stamped self addressed envelope for your convenience to return the form. Sign your name and school if you would like.

Thanking you in advance for your cooperation, and have a great summer!

Sincerely,

Jo Anne Murphy

Jo-Anne Murphy
Resource Teacher

TEACHING READING/LANGUAGE THROUGH COMPUTERS

A QUESTIONNAIRE

Would you take a few minutes to answer some questions concerning the use of computers in the teaching of reading/language arts?

1. Do you have microcomputers in your school?

   Yes____ No____

2. As a reading/language teacher do your students have access to a computer on a regular basis?

   Yes____ No____

3. | | |
   |---|---|
   | If the answer is yes do you take advantage of this access? | If the answer is no would you take advantage of the computer if you had access? |
   | Yes____ No____ | Yes____ No____ |

4. Have you had an opportunity to use or evaluate any software programs in reading/language?

   Yes____ No____

5. If the answer is yes, did you find the programs appropriate to the needs of your students?

   Yes____ No____

6. What kinds of software would you like to see for teaching reading/language arts?

7. Comments:

Thank You!

SELF-ESTEEM INVENTORY

Please mark each statement in the following way:

If the statement describes how you usually feel, put a check in the column LIKE ME

If the statement does not describe how you usually feel put a check in the column UNLIKE ME.

There are no right or wrong answers.

	LIKE ME	UNLIKE ME
1. I spend a lot of time daydreaming.		x
2. I'm pretty sure of myself.	x	
3. I often wish I were someone else.		x
4. I'm easy to like.	x	
5. My parents and I have a lot of fun together.	x	
* 6. I never worry about anything.		x
7. I find it very hard to talk in front of the class.		x
8. I wish I were younger.		x
9. There are lots of things about myself I'd change if I could.		x
10, I can make up my mind without too much trouble.	x	
11. I'm a lot of fun to be with.	x	
12. I get upset easily at home.		x
* 13. I always do the right things.		x
14. I'm proud of my school work.	x	
15. Someone always has to tell me what to do.		x

		LIKE ME	UNLIKE ME
16.	It takes me a long time to get used to anything new.		x
17.	I'm often sorry for the things I do.		x
18.	I'm popular with kids my own age.	x	
19.	My parents usually consider my feelings.	x	
20.	I'm never unhappy.		x
21.	I'm doing the best work I can.	x	
22.	I give in very easily.		x
23.	I can usually take care of myself.	x	
24.	I'm pretty happy.	x	
25.	I would rather play with children younger than me.		x
26.	My parents expect too much of me.		x
*27.	I like everyone I know.		x
28.	I like to be called on in class.	x	
29.	I understand myself.	x	
30.	It's pretty tough to be me.		x
31.	Things are all mixed up in my life.		x
32.	Kids usually follow my ideas.	x	
33.	No one pays much attention to me at home.		x
* 34.	I never get scolded.		x
35.	I'm not doing as well in school as I'd like to.		x
36.	I can make up my mind and stick to it.	x	
37.	I really like being a boy--girl.		x

		LIKE ME	UNLIKE ME
38.	I have a low opinion of myself.		x
39.	I don't like to be with other people.		x
40.	There are many times when I'd like to leave home.		x
* 41.	I'm never shy.		x
42.	I often feel upset in school.		x
43.	I often feel ashamed of myself.		x
44.	I'm not as nice looking as most people.		x
45.	If I have something to say, I usually say it.	x	
46.	Kids pick on me very often.		x
47.	My parents understand me.	x	
* 48.	I always tell the truth.		x
49.	My teacher makes me feel I'm not good enough.		x
50.	I don't care what happens to me.		x
51.	I'm a failure.		x
52.	I get upset easily when I'm scolded.		x
53.	Most people are better liked than I am.		x
54.	I usually feel that my parents are pushing me.		x
* 55.	I always know what to say to people.		x
56.	I often get discouraged in school.		x
57.	Things usually don't bother me.	x	
58.	I can't be depended on.		x

Instructions for Scoring and Interpreting the Self-Esteem Inventory

Developed By

Stanley Coopersmith 1967

The self-esteem inventory contains 58 items and a total of five subscales. This form provides a general assessment of self-esteem, which may be broken down into component subscales, depending on the goals and interest of the testor.

The five subscales are:

General Self-	Items 1,2,3,8,9,10,15,16,17.
Social Self-peers	Items 4,11,18,25,32,39,46,53
Home-parents	Items 5,12,19,26,33,40,47,54
Lie Scale	Items 6,13,20,27,34,41,48,55
School-Academic	Items 7,14,21,28,35,42,49,56

As notes above, the subscales have to be scored separately, with the exception of the Lie Scale. The responses indicated on the enclosed sheet indicate high self-esteem. The starred items are the Lie Scale items which indicate defensive reactions.

The scores are reported as:

1. Total number correct of all scales excluding Lie Scale for a maximum of 50.

The total number correct multiplied by 2 gives you a maximum score of 100.

2. A separate score total of response indicative of defensive lie reaction for a maximum of 8.

Appendix D

Sample First Page of Individual Log

1. Child's initials and either letter designation for the experimental group or number designation for the control group.
2. Scores or information for diagnostic purposes.
3. Pre-Test scores for CTBS Post-Test Scores for CTBS
   Spelling
   Vocabulary
   Language Mechanics
   Language Expression
4. Coopersmith's Self-Esteem Inventory
   Pre-Test Post-Test

5. General Goals of the Program.
6. Specific and individual goals for each child taken from the IEP.

In addition, the log book will include:

1. Weekly lists of vocabulary mastered.
2. Computer print-outs for section 3 in each module. (Creative Writing).
3. Anecdotal remarks deemed appropriate on feelings of self-worth and attitudes towards learning.

Marblehead Public Schools

2 HUMPHREY STREET MARBLEHEAD, MASS. 01945 (617)631-0900

DR. JAMES KENT, Superintendent of Schools

School Committee:— MARCIA L. SWEENEY, Chairperson DEXTER D. BUCKLIN, Vice-Chairperson
PAULINE L. HOWES, Secretary PAUL B. WARREN R. EDWARD CLISBY

September 23, 1983

Dear ________________________

As part of your child's program in the Resource Room I would like to incorporate an hour a week working on the Apple Computer with a language arts program I developed. It was specifically designed with the needs of the children enrolled in the Resource Room program in mind. This program will help us to determine if the computer can be helpful in maximizing their learning. I believe it will.

If you would like your child to take advantage of the computer project would you sign the form below, and we will attach it to your child's plan.

Please feel free to call me if you have any questions or want further information. Of course there will be complete anonymity in summarizing the results of the project at the end of the school year.

Thanking you in advance for your cooperation.

Sincerely,
Jo-Anne Murphy
Resource Teacher - Coffin School

I give permission for my child ______________________________

to take part in the Resource Room Computer Project.

Parent Signature ______________________________________

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September 23, 1983

Dear ______________________________

I have developed a Language Arts computer software program to be used with a few children at the Coffin School and in the Middle School during this school year.

In order to determine whether the program is worthwhile, and to decide whether it will be used throughout the town next year, I will have to measure the progress of the children using the program with similar children having similar needs in other schools.

We would like your permission to measure your child's growth with those of the children in the pilot programs.

This would mean comparing the growth from the spring 1983 CTBS to the CTBS testing that will be given in the spring of 1984 as well as other standardized measures involving self esteem.

Complete anonymity is assured as only your child's Resource Teacher will know the children involved in the study and will administer any testing used.

If the program is as successful as I anticipate, your child will be offered an opportunity to use the program next year.

Please feel free to call me with any questions you may have.

Sincerely,
Jo-Anne Murphy
Resource Teacher
Coffin School
Ext. 163

I give permission to have my child's scores compared to those of children in the pilot program.

____
Parent Signature

Changes In Vocabulary Scores

Student	Control Group	Student	Experimental Group
1.	1.5	A	0.3
2.	-0.1	B	0.4
3.	0.0	C	0.6
4.	1.0	D	1.5
5.	1.1	E	0.4
6.	0.5	F	0.9
7.	2.0	G	2.1
8.	1.1	H	0.9
9.	1.7	I	2.1
10.	2.1	J	3.8
11.	2.1	K	0.9
12.	1.7	L	1.6
13.	0.5	M	1.7
14.	1.4	N	0.4
15.	0.0	O	2.3
Total Change	16.6		19.9
Average Change	1.11		1.33

Changes in Spelling Scores

Student	Control Group	Student	Experimental Group
1	-0.5	A	0.4
2	-1.2	B	0.9
3	0.1	C	0.0
4	-0.1	D	4.3
5	-0.3	E	1.1
6	0.7	F	0.7
7	1.0	G	0.7
8	0.8	H	0.9
9	-0.6	I	1.5
10	1.9	J	1.1
11	1.7	K	1.2
12	1.2	L	0.8
13	1.7	M	1.7
14	0.7	N	0.6
15	-0.1	O	-0.2
Total Change	7.0		15.7
Average Change	.47		1.05

Appendix I

Changes in Language Mechanics Scores

Student	Control Group	Student	Experimental Group
1	1.3	A	0.0
2	2.5	B	0.0
3	3.8	C	-0.7
4	2.0	D	2.7
5	1.7	E	0.5
6	0.2	F	0.5
7	1.3	G	1.1
8	0.2	H	0.6
9	0.8	I	0.5
10	0.1	J	1.4
11	0.0	K	0.8
12	2.0	L	1.0
13	2.4	M	0.2
14	1.3	N	0.9
15	-0.2	O	1.2
Total Change	19.4		10.7
Average Change	1.29		.71

Changes in Language Expression Scores

Student	Control Group	Student	Experimental Group
1	3.4	A	0.7
2	-1.2	B	2.6
3	3.7	C	0.1
4	1.0	D	1.6
5	1.3	E	0.7
6	1.5	F	0.4
7	1.7	G	1.1
8	0.5	H	0.3
9	2.4	I	0.9
10	0.9	J	1.2
11	1.2	K	0.8
12	1.2	L	3.3
13	1.2	M	-2.7
14	1.6	N	0.4
15	-0.2	O	0.5
Total Change	20.2		11.9
Average Change	1.35		.79

Appendix K

Changes in Coopersmith Self-esteem Inventory Test

Control Group				Experimental Group			
Student	Pre-Test	Post-Test	Change	Student	Pre-Test	Post-Test	Change
1	84	84	0	A	80	90	+10
2	64	64	0	B	88	90	+ 2
3	78	78	0	C	68	84	+16
4	76	74	-2	D	70	72	+ 2
5	78	80	+2	E	70	80	+10
6	76	78	+2	F	44	48	+ 4
7	68	74	+6	G	74	78	+ 4
8	62	70	+8	H	50	56	+ 6
9	66	68	+2	I	82	88	+ 6
10	80	82	+2	J	68	74	+ 6
11	70	72	+2	K	70	76	+ 6
12	80	44	-36	L	66	70	+ 4
13	64	60	-4	M	86	78	- 8
14	80	82	+2	N	52	62	+10
15	80	78	-2	O	92	60	-32
Total Change			-18				+46
Average Change			-1.20				3.07

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